

MT. TRUMBULL ECOSYSTEM RESTORATION PROJECT

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ABSTRACT. This paper describes a pilot project to provide ecological information about changes in ponderosa pine and a "learn by doing" operational-scale adaptive ecosystem restoration experiment. This project would be implemented in the next few months in the Mt. Trumbull area in northwest Arizona on BLM administered land. This land provides important wilderness, wildlife habitat, and recreational opportunities.

In recent years, the number and size of wildfires throughout the United States has increased. Costs of these fires in terms of lost lives, private property and natural resources, as well as fire fighting costs, have significantly increased. This proposed project directly addresses this problem and thus has widespread value. Research indicates tree population irruptions resulting from fire exclusion have led to declining trends in both plant and animal diversity, vegetative productivity, tree vigor, and water availability. At the same time, fuel loads, disease and insect epidemics, and crownfire severity have increased creating unhealthy ecological conditions. Reversing these trends is clearly desirable.

A comprehensive package of mechanical, biological, and pyric treatments coupled with scientific research is proposed. In contrast to historical forest management in which old-growth trees are removed and younger trees are left behind, our restoration treatments would consist of removing younger trees and leaving the large, yellow-barked pines. Heavy forest floor accumulations would be raked away from old-growth trees; then smaller tree removal and prescribed burning would occur. Once restoration treatments are in place, a cost-effective prescribed natural fire regime would be implemented. The proposed ponderosa pine restoration area would exceed 10,000 treated acres. Some of these acres are inside designated wilderness, which poses specific challenges and restrictions. Simultaneous management research and evaluation would utilize university scientists. Collaboration among agencies, interested publics, and the scientific community, and adaptive management are integral parts of this proposal.

INTRODUCTION

In recent years the number and size of wildfires has increased. The costs of these fires in terms of lost lives, private property and natural resources, as well as dollar costs of fighting the fires, have also significantly increased. This project directly addresses this problem and thus has widespread value. A detailed study plan will be developed once initial project plans are completed.

The benefits from ecosystem restoration in the ponderosa pine type will accrue to both local and national constituencies. Research indicates that tree

population irruptions resulting from fire exclusion have led to declines in both plant and animal diversity, vegetative productivity, tree vigor (especially old-growth trees), and on- and off-site water availability. At the same time fuel loads, disease and insect epidemics, and crownfire severity and size have increased at exponential rates creating unhealthy ecological conditions. Reversing these trends is clearly desirable. This project could serve as a prototype for ponderosa ecosystem restoration.

The proposed project lies within the ponderosa pine type of the Mt. Trumbull Resource Conservation Area in the Arizona Strip District. The project will provide information necessary for answering the question, "Can ecosystem restoration alleviate the negative environmental consequences of fire regime disruption and

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restore ecosystem health, and do so in an economically, socially, and politically cost-effective manner?". Collaboration among agencies, interested public and the scientific community is an integral part of this proposal. The experience gained and documents produced from this project will be useful to others throughout the West who are concerned with restoration of ecosystem health.

To accomplish this goal we propose a comprehensive package of ecosystem restoration treatments coupled with scientific research. The proposed project was developed by an interdisciplinary process which is described in the "Planning Approach" section below. Approximately 1,000 acres per year for ten years would be restored. The proposed ponderosa pine restoration area would exceed 10,000 treated acres, making this the largest ecosystem restoration project of its type. Some of these acres are inside designated wilderness, which poses specific challenges and restrictions. Such a large-scale project is needed to clearly demonstrate results over a management-sized area. Simultaneous management research and evaluation would be interdisciplinary utilizing university scientists with demonstrated expertise in restoration ecology, plant and animal conservation biology, ecological economics, community ecology, and fire. These scientists have a history of successful collaboration on related, but smaller-scale pine ecosystem restoration projects. They propose to document the ecological effect of the restoration treatments with replicated study plots contrasted to each other and to control plots and to produce both scholarly and public information syntheses of ecological restoration knowledge in a variety of media formats.

In contrast to historical forest management treatments in which old-growth trees are removed and younger trees are left behind, our restoration treatments consist of removing the trees which have come in since fire regime disruption (*i.e.*, the portion of the tree populations which represent an unnatural population irruption) leaving behind the old-growth trees and sufficient "post-settlement" trees to restore pre-settlement forest structure. Heavy forest floor accumulations will then be raked away from the base of the old-growth trees. Finally, prescribed burning will be used to simulate the natural fire regime of the area. Once restoration treatments are in place, a cost-effective prescribed natural fire regime will be implemented.

Intensive gathering and analysis of existing information and new data from the project would be used to produce both public education and information for a variety of media formats (*e.g.*, slide presentations, videos, radio and television, brochures, booklets, and on-site information signs and nature trails), and to fulfill the NEPA process.

Results from this adaptive ecosystem restoration project could extend far beyond the Mount Trumbull

Resource Conservation Area. A clearly documented example of a practical ecosystem restoration application will be of great value to both the general public and land managers who are confronting similar problems throughout the natural range of western long-needed pine ecosystems (50,000,000 acres at the time of Euro-American settlement) and in other forest types which evolved under the influence of frequent fire.

DESCRIPTION OF THE AREA

The 120,000 acre Mt. Trumbull Resource Conservation Area (RCA) is located in northwest Arizona about 6 miles from the nearest paved road and is bounded on the south by the northern boundaries of Grand Canyon National Park and Lake Mead National Recreational Area. Mount Trumbull, highest point on the Arizona Strip, dominates the surrounding landscape. The RCA consists of 88 percent BLM administered public land, with the remaining area being 6 percent State land and 6 percent private land. In 1984, 22,500 acres of BLM land in what is now the RCA around Mt. Trumbull and Mt. Logan were designated by Congress as wilderness.

Ponderosa pine occurs on 13,200 acres within the RCA. Management of the ponderosa pine ecosystem is significantly affected by both past harvest and fire history and wilderness designations. Livestock grazing has also had some effects. Future pine ecosystem management in wilderness may be tied to non-motorized technologies and minimum tool consideration. Some of the ponderosa pine, chiefly that at the higher elevations and more inaccessible locations, has never been logged. Various combinations of wilderness area/never logged, wilderness area/previously logged, and non-wilderness area/previously logged exist in the ponderosa pine type.

The RCA is located nearly centered between Lake Powell and Lake Mead on an east/west axis, and between Zion National Park to the north and the Grand Canyon to the south. The Kaibab Plateau and the Kaibab National Forest lie less than thirty miles to the east. In contrast to the Kaibab Plateau, the Trumbull area does not have a recent history of intensive timber harvest. There are no existing timber sales or plans for extensive timber cutting.

Unlike most of the rest of the West, the area appears to have a relative abundance of 300-800 year-old trees. Yet overall, fire disruption has set into motion changes in ecosystem structure and function that threaten not only the survival of the old-growth trees, but also the sustainability of the entire ecosystem. Biodiversity and fire dependent species are currently declining. Recent research by Northern Arizona University scientists from small-scale studies near Flagstaff indicates that treatments which restore pre-settlement structure and

function in ponderosa pine ecosystems dramatically improve the health of old-growth trees and enhance ecosystem health and human habitat values.

LAND USE PLANNING

The draft 1989 Arizona Strip Resource Management Plan (RMP) generated public comments and controversy regarding potential management of ponderosa pine and other resources in the Mt. Trumbull area. BLM responded to these public concerns in the final RMP (1992) by designating the area as the Mt. Trumbull RCA and by directing that the ponderosa forest be managed only for the enhancement of other resources, such as wilderness, wildlife, and recreation. The need for additional planning was recognized and a commitment was made to develop tailored management prescriptions for the Mt. Trumbull RCA and to involve interested publics and other agencies in future planning. Additionally, the RMP states that the area is to be managed to maintain a healthy, biologically diverse, ecosystem.

PLANNING APPROACH

The Mt. Trumbull RCA planning effort offers a unique ecosystem management study opportunity. Recreational use of the area is closely tied to adjacent Park Service lands, as well as state and private lands within the boundaries. An interdisciplinary planning team consisting of BLM, AGFD, NPS, local citizens, livestock grazing permittees, Kaibab Industries Inc., and conservation organizations was invited to develop this plan. A mission statement was developed stating that by consensus the team would define future conditions for the Mt. Trumbull area while maintaining sound ecosystems. A flexible boundary for the study area was established which can be adjusted as the plan is implemented. Through consensus, the interdisciplinary planning team first identified issues and then developed draft management objectives to resolve these issues.

ADAPTIVE MANAGEMENT

Using the best available science, an adaptive ecosystem management approach is proposed to meet objectives and carry out proposed management. Since the RCA plan is adaptive it is expected to have an indefinite life span. Potential actions would be limited by tool availability, constraints on tool use, and available funds. Potential actions would be considered by the Mt. Trumbull RCA Team through a screening process and

subject to a site specific NEPA analysis. Subsequent decisions would be made by monitoring and evaluating the planned management actions and their effectiveness. Plan refinement and monitoring would be an ongoing process by the team, interested public, and ad hoc interagency management and research peer reviews. We anticipate that the approach being tried at Mt. Trumbull to solve existing ecosystem problems will be successful and could serve as the foundation for developing ecosystem restoration and management programs throughout the ponderosa pine type.

SPECIFIC PLANNED ACTIONS

A brief description of the nine planned specific projects or actions follows:

1. **NAU-GUIDED SCIENTIFIC STUDIES AND PUBLIC EDUCATION PLOTS.** An integrated set of research and demonstration studies will quantify the effects of restoration treatments on vegetation and fuel structure, wildlife and human habitat characteristics, aesthetics, old-growth tree vigor, and biodiversity of insects which represent critical components to ecosystem structure and function (food webs, plant population controllers, nutrient cycling, etc.). These studies consist of a combination of historical and experimental studies. First, to estimate the long-term effects of different treatment scenarios (including no action), dendroecological studies of existing crownfire, bark beetle kill, thinning, and prescribed burn sites in the Mount Trumbull area will be conducted. Second, controlled experimental procedures will be used to implement management treatments including combinations of mechanical thinning of post-settlement trees, induced bark beetle thinning (using pheromone baits), and prescribed burning. Five sets of replicated 20-acre restoration treatments would be established to test and demonstrate mechanical and prescribed burning ecosystem restoration treatments. Treatments would consist of control, thin only, thin and burn, and burn only applications. A companion set of 30 one-acre spot treatment test plots would be established to examine mechanical and bark beetle thinning spot treatments for potential use in wilderness restoration. These experimental plots would be distributed primarily in the areas described in items 3 and 4 below. Operational projects would be designed to accommodate the experimental studies.

A derived benefit from these management treatments will be the development of a model system to evaluate several key ecological indicators and processes as measures of resource condition. Biological indicators of ecosystem health allow for the continued

monitoring of resource condition following natural or anthropogenic disturbance and stress. The development of biological indicators of ecosystem health would have broad applicability to pine forests of the western U.S.

2. PUBLIC INFORMATION, EDUCATION, AND INVOLVEMENT.

Public outreach efforts to inform the visiting public and help them understand and participate in the restoration efforts would include the design and construction of a small, centralized contact station in the Nixon Flat area. This station would provide information and interpretation covering diverse local resource topics around the central theme of ecosystem restoration. Additionally, one of the accessible, easily visible, project sites would be selected as a public demonstration site and would provide on-site interpretation of the restoration efforts.

In addition to reaching the visiting public on-site in the Mt. Trumbull area, off-site information and interpretation efforts would be needed to "bring the public along" on the restoration efforts. Outreach would include news releases, progress updates, the design and printing of a four-color brochure, videotapes, slide presentations, and the design and fabrication of an exhibit to be displayed at the new Interagency Office and Information Center in St. George, Utah. Mobile traveling displays for presentation at fairs, schools, or civic organization functions would be developed.

3. INTENSIVE ECOSYSTEM RESTORATION RESEARCH AND DEMONSTRATION AREA.

The unit comprises 448 acres, characterized by approximately five old-growth ponderosa pine trees per acre and an abundance of younger age class trees. Many of the old-growth trees appear to be in excess of 500 years old. Management practices have led to an ecosystem which is not sustainable and which is showing increased mortality of old-growth trees likely due to competition with overstocked younger age class trees. The restoration treatment for this area will consist of removing the majority of the post-settlement trees, raking heavy fuels from the base of the old-growth trees, and burning at a frequency which approximates the natural fire regime. Fire control lines would be constructed and used in conjunction with existing roads to contain prescribed fires.

4. ECOSYSTEM RESTORATION CROWNFIRE BREAKS. Nearly 100 years of fire suppression have led to a significant build up of fuels in the RCA. Without restoration, current fuel conditions are such that continued ecosystem degradation leading to major crownfires is inevitable. Until the built-up fuels are reduced to the point where wildfires can be allowed to burn naturally, expensive fire control and suppression will continue to

be needed. Therefore, initial work to restore pre-settlement ecosystem conditions will focus upon fragmenting the largest blocks of heavy fuel in order to reduce the risk of large wildfire occurrence and suppression costs if one does occur. Strips of restored forest approximately 100 yards wide and a total of 6 miles long will be created. These restored strips will serve as starting lines for subsequent restoration efforts.

5. MT. LOGAN WILDERNESS RESTORATION. During the mid 1970s while the area was under USDA Forest Service administration, about 700 acres of the ponderosa pine type in the Mt. Logan area was mechanically thinned to reduce competition between trees and to allow faster growth of the remaining trees. The cut trees were left where they fell, causing a dangerous build up of litter. These fallen trees, along with accumulations of needles and other litter, have created a high fire risk. In about 150 acres with heavier litter, the cut trees have been piled and burned in preparation for an underburn to further reduce fire hazard. In 1984, the Mt. Logan Wilderness Area was designated and included 600 acres of the 700 acre thinning. To enhance wilderness values and reintroduce fire into the area, completion of the underburn is necessary. Old-growth ponderosa will be protected during the burn, as described in 1 above.

6. MT. TRUMBULL WILDERNESS SPOT RESTORATION TREATMENTS. The Mt. Trumbull Wilderness Area contains 1,300 acres of the ponderosa pine vegetation type. Due to limited accessibility, this area has not been logged and contains a density of approximately 9-10 old-growth trees per acre. After assessment of initial spot restoration treatment effects (see number 1, above), old-growth trees will be protected from wildfire by raking forest litter away from their bases and released from competition by mechanically removing (utilizing minimum tool policy) younger age class trees within 50-100 feet from their bases. Slash will be burned under prescription. These actions, while preserving old-growth trees initially, will also allow for future use of prescribed fire, whether human or lightning ignited, with the ultimate goal of having a natural fire regime returned to this wilderness area. This area will serve as an excellent natural laboratory for testing adaptive ecosystem restoration in wilderness areas.

7. ECOSYSTEM RESTORATION AND MANAGEMENT WORK CENTER. Public use of the Mt. Trumbull RCA is rapidly changing. BLM's use of the present Mt. Trumbull Administrative Site is also changing and the location is now used by up to 40 people at a time. Current uses include: cultural, volunteer, and univer-

sity groups, land use planning meetings, wildlife survey crews, etc. Furthermore, this project will require additional facilities dedicated to the ecosystem management research effort. The existing fire guard station dates back to the late 1950s and pays scant attention to esthetics. It can accommodate only eight comfortably, and has inadequate facilities for meetings, meal preparation, and restrooms to support current and projected uses. The sleeping facilities, showers, and restrooms are not adequate for accommodation of both males and females concurrently. A new 3,000 square foot building is proposed with room for meetings, a ramada for eating and sleeping under during inclement weather, restrooms, and an information kiosk for visitors in the area, plus reasonable associated provisions for fencing, signs, water, and sewer.

8. **PLANNING/NEPA.** An Environmental Assessment (EA) will be prepared for the Mt. Trumbull RCA management plan. Adaptive ecosystem management will require adjustments to the proposed RCA plan as new information becomes available, which in turn will require additional NEPA compliance. Supplemental environmental assessments (EA) will be prepared for proposals which are not adequately analyzed in the original EA. Site specific cultural and/or threatened and endangered species or candidate species clearances will also be a component of supplemental EAs, as will wilderness considerations. Public review and comment will be included and will be critical for continued public support.

9. **ADMINISTRATION, MONITORING, EVALUATION.** To effectively manage and coordinate all facets of the RCA implementation and ecosystem restoration, a project administrator and additional staff will be needed. Even with extensive use of contracts, additional staff will be needed to plan and design projects, prepare and supervise contracts, and ensure quality control. Intensive monitoring and evaluation of planned actions to ensure that objectives are being met would also be required. Agency on-the-ground project work being done concurrently with academic research,

along with the required public involvement, will require considerable communication to ensure a fully coordinated and a truly adaptive ecosystem management approach. There will also be a considerable workload in disseminating the information accrued.

PAYING FOR THE PROJECT

An final objective of this effort is to determine the costs and feasibility of ecosystem restoration and public support for various types of treatments, particularly inside wilderness. It is believed that volunteers could be used to help save old-growth trees, particularly in wilderness and efforts are underway to secure such help. Wood sales and salvage of materials could off-set the cost in areas where mechanical thinning is done.

For example, in areas outside wilderness where post-settlement trees in the 5-16 inch class are mechanically removed, 3,000 - 5,000 board feet per acre suitable for industrial processing could be salvaged. The Pearson Natural Area restoration treatment, near Flagstaff, AZ, (funded by the National Science Foundation) and similar to the Mt. Trumbull area, yielded 5,300 board feet per acre from post-settlement tree removal.

CONCLUDING REMARKS

As mentioned earlier, we are proceeding with prescribed burning in the Mt. Logan area to reduce existing heavy levels of fuel. This work is expected to continue and the other efforts described above will be implemented as funding is secured. Completion of a draft management plan for the Mt. Trumbull RCA and completion of the related required NEPA documentation, with full public and agency review, is the next major step.

I think you will be hearing positive things about the Mt. Trumbull project and its applications as we start to do more work on the ground.